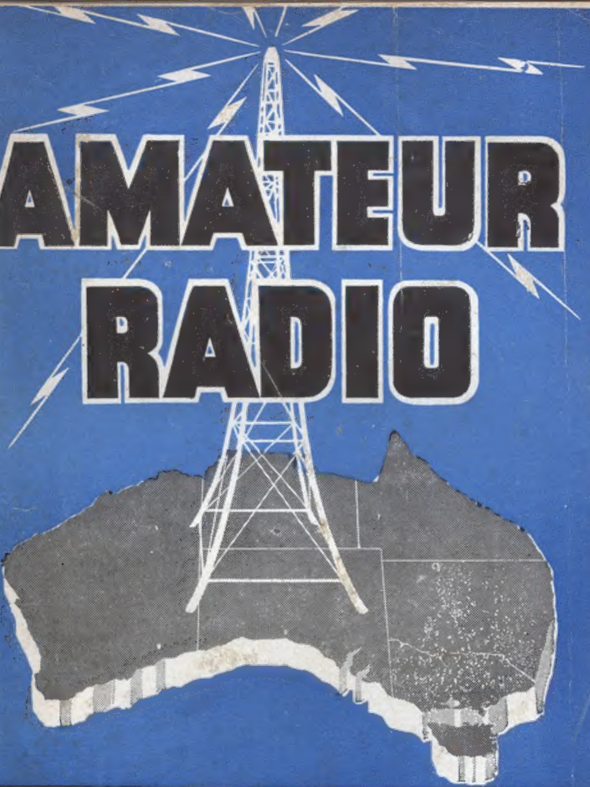
AMATEUR RADIO



ROYAL AUSTRALIAN AIR FORCE WIRELESS RESERVE

Published in the interests of the Wireless Institute of Australia, Official Organ of all divisions of the W.I.A. and R.A.A.F.W.R.

WIRELESS INSTITUTE OF AUSTRALIA

PRICE 6D

JANUARY, 1940

WESTON *Instruments*

Essential Equipment in Every Experimenter's Kit . .

Small and compact, these pocket size Western Test Units are admirably suited for all testing and experimental purposes. They can be carried conveniently in your coat pocket or can be stored away in a table drawer for easy reference.

Model 695 (on left).—Power Level Meter, Voltmeter, Output Meter. A rectifier type voltmeter, which gives readings in decibels as well as volts. Ideal for all types of audio equipment.

Model 697 (Centre).—Volt-Ohm-Milliameter. This unit covers a.c. and d.c. voltage, d.c. milliampere and ohm ranges. Precision resistors are used throughout. Voltage, current and resistance ranges are brought out in pin jacks and are selected by toggle switches.

Model 571 (on right).—Output-Meter. This has a constant resistance of 4000 ohms on each range, and is usually used as a terminating device on sound line or receiver output circuits.

Write or call for literature and full particulars.

Warburton Franki (Melb.) Ltd.

380 BOURKE STREET, MELBOURNE. MU 6353
Also at Sydney and Brisbane.

AMATEUR RADIO

Published in the Interests of Radio Amateurs and Experimenters throughout Australia.

VOL. 8. No. 1. 1st JANUARY, 1940

OUR ORGANISATION

Publishers.—
WIRELESS INSTITUTE OF AUSTRALIA
(Victorian Division)
191 Queen Street, Melbourne, C.1.

Editorial Department.—
W. R. GRONOW (VK3WG),
Editor.

R. H. CUNNINGHAM (VK3ML)
Technical Editor.

C. SERLE (VK3RX)
Notes Editor.

V. E. MARSHALL (VK3UK)
Compilation.

H. N. STEVENS (VK3JO)
Distribution.

L. T. POWERS (VK3PS)
Secretary.

Advertising Department.—
BEDGGOOD ADVERTISING CO.,
129 William Street, Melbourne.
Phone: MU 4046

Sydney Representative—
J. H. FRASER
8 Deakin Avenue, Haberfield. UA 1725.

Printers.—
H. HEARNE & CO. PTY. LTD.,
285 Latrobe Street, Melbourne, C.1.

Accounts Department.—
LARGE & POWERS,
Chartered Accountants (Aust.),
422 Collins Street, Melbourne.

MSS and Magazine Correspondence should be forwarded to The Editor, "Amateur Radio," Box 2611W, G.P.O., Melbourne.

CONTENTS.

DIVISIONAL ADDRESSES.

FEDERAL HEADQUARTERS:
BOX 2611W, G.P.O., MELBOURNE

NEW SOUTH WALES:
BOX 1734JJ, G.P.O., SYDNEY.

VICTORIA:
BOX 2611W, G.P.O., MELBOURNE.

QUEENSLAND:
BOX 1524V, G.P.O., BRISBANE

SOUTH AUSTRALIA:
BOX 284D, G.P.O., ADELAIDE.

WESTERN AUSTRALIA:
BOX N.1002, G.P.O., PERTH.

TASMANIA:
BOX 547E, G.P.O., HOBART.

Subscription Rate is 6/- per annum in advance (post paid).

NOTE.—Advertisers' change of copy must be in hand not later than the 20th of the month preceding publication, otherwise the previous month's copy will be reprinted.

CROWN RADIO PRODUCTS

ANNOUNCE

NEW
POPULAR PORTABLE
COIL KIT

Two Iron Core I.F. Transformers, square can, $2\frac{3}{8}$" x $1\frac{3}{8}$"
One Midget Pye Wd. Osc. Coil.
One Special Loop Aerial Coil.
One 465kc. Padding Condenser.

LIST PRICE 32/6

For use with Stromberg-Carlson Type "G" Condenser.
Suitable Dials Available.

Kit is cartoned, and circuit diagram with assembly instructions provided.

Build your own "Portable with "CROWN" RELIABLE COIL KIT.

CROWN RADIO PRODUCTS PTY. LTD.,
51/53 MURRAY STREET, PYRMONT, N.S.W.

EDITORIAL

The Magazine Committee had hoped to provide details of Hams who were serving with the various branches of the Defence Forces, but unfortunately the censorship restrictions do not permit of the publication of such information. However, this **CAN** be said, the response of the amateur movement to the Call for Service has been literally astounding. Within two months of the outbreak of war practically every amateur able to join had enlisted in one of the signal branches of the three services. We know of one Signals Unit, and a key unit, too, that has fourteen Hams out a total personnel of sixteen. It can be truly said that no section of the community has given greater co-operation than the Amateur movement, even if we do say it ourselves!

We would like to wish all members a very happy New Year and express the hope that 1940 will bring as many PLEASANT surprises as the number of UNPLEASANT ones 1939 produced!

Looking back on 1939 in retrospect, it can certainly be said that few years in our history brought up so many and varied incidents. The year opened with the most disastrous bush fires in our country's history, and brought forward one of our greatest opportunities to prove the value of Ham Radio to the civil community. Then the blows started to fall. Firstly, Cairo, with the announcement of shared channels on 7 mc, and the feeling that we were fortunate to escape with only a few scars. The 1st of September brought in the new conditions agreed upon at Cairo, and two days later, the greater blow fell—WAR, and the withdrawal of our Experimental Licences. The rest of the year we have already commented on.

If we had a distorted sense of humor, we could say that no further blow could fall on Ham Radio in 1942 at the next International Convention, because indications are the war will still be in full swing then, and there won't be a Convention anyhow!

W.I.A. NEWS DIGEST.

Amateurs Application Knocked Back.

The Chief Radio Inspector has notified the W.I.A. that its application for restoration of experimental licenses on Ultra High Frequencies has been refused.

Despite this refusal, Federal H.Q. is endeavouring to have this decision reversed, and every effort will be made to bring this application to a successful conclusion.

Proposal for Official Institute Station.

F.H.Q. has applied for allocations between 7,200 K.C. and 7,300 K.C. for official station in each State to disseminate Institute information and items of general interest.

Radio Register Forms pouring into Headquarters.

We are again enclosing a register form in this issue. If yours has not been sent in—do it now! A form would also be appreciated from non-members, so that a complete survey may be compiled. Pass on this form to a non-member if yours is already posted.

Commercial Certificate Regulations Need Amending!

Why should applicants for commercial operator's certificates be compelled to prove practical experience on ship or shore stations when such stations are not available except to employees of those stations?

Where are our country correspondents?

Very little news of country zones is being received. Any notes on happenings in **your** zone would be appreciated.

Factors Determining the Choice of an Intermediate Frequeucy

By R. Lackey, A.M.I.R.E. (Aust.).
(Chief Instructor, Australian Radio College).

Apart from the selection of tubes and operating conditions, the selection of an intermediate frequency, or perhaps I should say, the selection of intermediate frequency transformers, has a greater effect on a receiver's final performance than that of any other components.

We are all familiar with the effect of I.F. transformers designed to operate at the same I.F., but with differing values of "Q" factor. I do not propose to go into the effect of varying the "Q" of I.F. transformers operating at a certain, frequency but rather to discuss the effect of typical transformers operating at different frequencies.

When the superheterodyne first became popular as an ordinary broadcast receiver during 1930 or 31, practically all manufacturers employed a standard I.F. of 175 K.C. The years that followed have seen a gradual change to frequencies in the vicinity of 460 K.C., so that 175 K.C. is now practically unused except in the case of a few automobile receivers. At the present time most receivers for short wave frequencies employ an I.F. in the vicinity of 460 K.C., but it seems likely that in the near future there will be a change to a higher I.F. in this type of set. Two suitable frequencies are 1645 or 1675 K.C.

It is interesting to examine the reason for the selection of the various frequencies used.

Two of the most important factors which have to be considered in choosing a frequency are sensitivity and selectivity. Both of these factors are largely dependent on the "Q" of the I.F. transformers. As Q equals $\frac{\text{reactance}}{\text{resistance}}$ it is quite obvious that in the case of low and high frequency transformers tuned by the same capacity and constructed along similar lines the reactance will increase as the reciprocal of the frequency and at the same time the H.F. resistance will decrease at low frequencies, although the greater amount of wire employed on the coil tends to keep the resistance approximately constant. The increased reactance, however, means that a low frequency transformer would have a higher "Q".

In recent years the "Q" of high frequency transformers has been improved by using a smaller capacity condenser for tuning, about 100 mmfds. max. instead of about 200 mmfds, max., thus increasing the reactance. At the same time, H.F. resistance has been decreased by employing litz wire and low loss insulators in the transformer construction, also by the use of H.F. iron cores.

Although this improvement in "Q" means that the sensitivity of a modern receiver using a high I.F. is approximately the same as older types using a low I.F., it does not follow that the selectivity is the same, as will be seen later.

In the following examples I will compare I.F. transformers having a similar "Q", but in one case operating at 175 K.C. and in the other case at 455 K.C.

The selectivity of a superheterodyne receiver in rejecting interfering signals on channels adjacent to a desired station is determined almost exclusively by the selectivity of the I.F. transformers.

After passing through the frequency changer tube, signals from an unwanted station, 10 K.C. away from those of a desired station, would produce an I.F. 10 K.C. on one side of the I.F. In the case of a 455 K.C. I.F. the difference in frequency between the two signals is $\frac{10}{455} \times \frac{100}{1}$% or 2.2%, while with 175 K.C. I.F. the frequency difference is 5.7%. Thus, roughly speaking, the selectivity of the 175 K.C. I.F. amplifier

is $\frac{5.7}{2.2}$ or 2.6 times as good as the 455 K.C. amplifier. Of course, these calculations neglect many minor factors which affect the selectivity, but they serve to give some indication of the variation in selectivity which can be expected.

From the point of view of sensitivity and particularly of selectivity, a low I.F. has a big advantage. As far as stability is concerned also, a low I.F. has the advantage, for capacitative feed back through stray wiring capacities or through the internal plate to grid capacity of tubes, decreases in proportion to the frequency. There are many other facts however, which also have to be taken into consideration and which have forced a sacrifice in sensitivity, selectivity and stability in order that they may be dealt with more favourably.

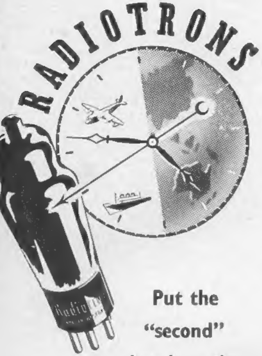
TONE QUALITY.

Tone quality is one of the most important characteristics of receivers for broadcast reception although this is not important in the case of a communications receiver used mainly for the reception of speech or morse code signals.

A receiver employing a 175 K.C. I.F. is inclined to be too selective for good quality reproduction of high pitched sounds. The effect is twofold. Firstly, if good reproduction is to be had of frequencies up to 5000 cycles, it is necessary that the I.F. amplifier pass with approximately equal strength all frequencies in a band width of 10 K.C., i.e., sidebands up to 5 K.C. on either side of the resonant frequency.

A second manner in which extreme selectivity affects A.F. reproduction is that the low decrement of the high "Q" circuit causes a comparatively slow decay of the oscillations induced by a sudden transient such as a pistol shot or percussion instrument. Instead of the transient finishing abruptly it gradually decreases in strength and this fact is worthy of consideration in the case of high fidelity receivers.

From the foregoing it is obvious that there is a tendency for a low I.F. to be too selective so that the rereproduction of high pitched audio frequencies and transients suffer.



Put the "second" hand on the clock of communication

In the space of a split second, the latest news flashes across the world to you with clarity and brilliance — when your radio is re-valved with

Sealed for your protection

INTERFERENCE.

One of the main reasons for the change from low to high I.F.'s is that many forms of interference, other than simple adjacent channel interference, are solved by the use of high frequency.

"DOUBLE-SPOT" TUNING.

As the name implies, double-spot tuning consists of receiving the same station at two separate points in the tuning range of a receiver. It is brought about by the fact that an intermediate frequency is produced both when the oscillator frequency is higher than the signal frequency by the amount of the intermediate frequency or when it is lower than the signal frequency by the amount of the intermediate frequency. To give a numerical example, consider a station operating on 1,400 K.C. with and I.F. of 175 K.C. in one instance and 455 K.C. in a second instance. In the case of the 175 K.C. set the oscillator frequency is 1575 K.C. If the tuning dial is now rotated until the oscillator frequency is 1,225 K.C., or in other words until the tuning dial corresponds to a position for receiving a station on 1,050 K.C. the difference between the oscillator frequency and the original 1,400 K.C. station will still produce the I.F. of 175 K.C. and this 1,400 K.C. station would be received with the dial in position for 1,400 K.C. and also in a position corresponding to 1,050 K.C. This fact is minimised by employing highly selective circuits before the grid of the frequency changer tube, but cost limits the number of tuned circuits before the grid of the frequency changer to one in most instances, and one tuned circuit is unable to prevent powerful signals from reaching the grid of the following tube even though they are 350 K.C. away from its resonant frequency.

In the case of a 455 K.C. I.F. the oscillator frequency for a station on 1,400 K.C. will be 1,855 K.C. It would be impossible for the receiver to bring in this station on a second spot on the tuning dial, because the oscillator frequency would only be lower than the signal frequency by 455 K.C. when the set was tuned to receive a signal of 490 K.C. This frequency, however, is outside the broadcasting band and ordinary receivers are not capable of bing tuned to such a low frequency.

Double spot tuning is quite annoying in broadcast receivers employing an I.F. of 175 and it is far more annoying in short wave receivers, even though they employ an I.F. of 455 K.C. Just as the use of a higher I.F. cures the trouble in the case of a broadcast receiver, so the use of a higher I.F. would cure it in the case of a short wave receiver and the use of an I.F. of 1,645 or 1,675 K.C. would make a big improvement in this direction.

IMAGE INTERFERENCE.

This form of interference is very similar to double spot tuning only it is caused by two separate stations producing the intermediate frequency at the same time. If a powerful local station is separated in frequency from some desired station by twice the intermediate frequency it is possible for both these signals to produce the intermediate frequency at the same time and to interfere with one another.

As a numerical example, consider a receiver tuned to 600 K.C. If the I.F. is 175 K.C. the oscillator frequency will be 775 K.C. If a powerful station is operating on 950 K.C. and this station is able to pass through the first tuned circuit so that it reaches the grid of the frequency changer it will mix with the oscillator frequency and produce the intermediate frequency, because 950—775 equals 175 K.C.

This form of interference also responds to an increase of I.F.

If the same 600 K.C. station is being received and an I.F. of 455 K.C. is now used, the oscillator frequency will be 1.055 K.C. An interfering signal to beat with this oscillator frequency would have to be 455 K.C. higher again or in other words 1,510 K.C. This is actually outside of the broadcast band as we know it at the present time, but as the broadcast band is to be extended to 1,600 K.C. it is remotely possible for image of a station operating at a higher frequency than 1,500 K.C. to cause image interference in the future. As the circuit before the grid of the frequency changer is tuned to 600 K.C. however, it has a very good chance of eliminating any interfering station so widely separated from the original frequency.

Image interference is also very troublesome in short wave receivers and here again an increase of intermediate frequency to a value in the vicinity of 1,650 K.C. would result in a considerable improvement.

An actual example of one preva-

lent form of image interference in modern broadcast receivers even though they employ an I.F. of 455 K.C. is that the radio station operated by the Police Department on 1,725 K.C. will beat with the oscillator frequency of a set when it is tuned to receive a station on 810 or 820 K.C. The result of this is that the signals from the Police Station can be heard quite distinctly in many areas around the city and suburbs when a receiver is tuned to 810 K.C. or thereabouts.

OSCILLATOR HARMONICS.

Still another form of interference is produced as a result of interfering stations mixing with harmonics of the oscillator frequency. In addition to producing the fundamental oscillator frequency the types of oscillator circuits used in modern broadcast receivers produces quite a considerable percentage of both second and third harmonics of the oscillator fundamental. If any interferring signal from a powerful station is separated from the oscillator harmonics by the amount of the intermediate frequency, it will produce an intermediate frequency and its modulations will either be heard from the speaker or will beat with the desired station causing an annoying whistle. For a numerical example, consider a receiver tuned to a station on 550 K.C. and using an I.F. of 175 K.C. The oscillator frequency in this case is 725 K.C., and its second harmonic is 1,450 K.C. Now any powerful station which is operating at a frequency of 175 K.C. higher or or lower than 1,450 K.C., that is any station operating on 1,625 K.C. or on 1,275 K.C., could produce spurious intermediate frequency if it reaches the grid of the frequency changer. It will be noted that these interfering frequencies are widely separated from the desired frequency, and consequently any tuned circuits before the grid of the frequency changer will have an excellent chance of rejecting the unwanted signals, but if the unwanted signals come from a powerful nearby station, they can quite easily cause interference. This trouble responds to an increase of I.F. as we will see in the next example. When an I.F. of 455 K.C. is used, the oscillator frequency for the 550 K.C. station

United Radio Distributors Pty. Ltd.

cordially invite all their friends, when in Sydney, to call in to see——

NEW HALLICRAFTER COMMUNICATION RECEIVERS
UNIVERSAL RECORDING MACHINE
UNIVERSAL MICROPHONES

and many other interesting samples which our Managing Director has brought back from America.

Top Left—Universal Recorder.
Below—Hallicrafter Skyraider

234 CLARENCE STREET, SYDNEY.

'Phones: MA 2382, MA 7891

will be 1,005 K.C. The second harmonic of this is 2,010 K.C. and interference could only be caused by stations operating on 2,010 plus or minus 455 K.C., that is, 2,465 K.C. or 1,555 K.C. As both these frequencies are well outside the broadcasting band, and they are evenly more widely separated from the desired station than in the last example, there is considerably less chance still of this form of interference. To show that it is not completely remote, interference is caused by the Police Broadcasting Station beating with the 2nd harmonic of the oscillator when a receiver is tuned between 630 and 640 K.C. If the tuning dial is actually set to 635 K.C., the oscillator frequency will be 1,090 K.C., its second harmonic will be 2,180 K.C., and this is exactly 455 K.C. higher than the frequency used by the Police Station.

This same form of interference occurs when tuning to short wave lengths, and here again increasing the I.F. value in the vicinity of 1,650 K.C. will effect a considerable improvement.

FREQUENCY CHANGER HARMONICS.

Due to the bend in the characteristic curve of the frequency changer tube, harmonic frequencies will be generated of all signals which reach the grid of this tube. For example, if a station is operating at a multiple of the I.F. one of its harmonics will beat either with the oscillator frequency or a harmonic of the oscillator frequency to produce interference in the form of annoying whistles. For example, take the case of a signal having a frequency equal to twice that of an I.F. of 455 K.C. This would be a station operating on 910 K.C. When this signal reaches the grid of the first detector, there will also be produced its second harmonic which is 1,820 K.C. The oscillator frequency is 910 plus 455 K.C. or 1,365 K.C. It will be observed that this oscillator frequency is also 455 K.C. lower than the second harmonic of the signal frequency and so interference results. This form of interference is not effected in any way by the degree of selectivity before the grid of the frequency changer, and contrary to most of the other forms of interferences examined, it is less pronounced with a low intermediate frequency than with a high one. This is due to the fact that it would only be the 3rd or 4th harmonic of the signal frequency which would beat with the second or third harmonic of the oscillator frequency when a low I.F. is used. As succeeding harmonic frequencies decrease in strength the extent of interference would also decrease.

In selecting an I.F. it is naturally necessary to see that the frequency chosen does not correspond to that of a powerful long wave station, and also to see that the frequency does not correspond to the difference between the frequencies of two powerful local stations.

If the intermediate frequency is the same as that of some broadcasting station, then strong signals from this station on reaching the grid of the frequency changer would be able to pass straight on through the I.F. amplifier. This consideration is of importance in determining a suitable frequency for a short wave receiver. The frequencies of 1,645 and 1,675 K.C. suggested in this paper have been chosen because they are not occupied by any powerful station here in New South Wales at any rate.

The frequencies of 175 K.C., 455 K.C., 1,645 K.C., and 1,675 K.C. are all quite different to the separation in frequency of any powerful New South Wales stations. If an I.F. were chosen which was equal to the difference in frequency between two powerful stations, signals from these two stations would mix in the frequency changer producing the I.F. and the modulations of both would be heard from the speaker.

There are many other possibilities of interference which have not been treated, but all the commonly experienced ones have been dealt with. Summarising the various forms of interference, it is evident that a high I.F. has a considerable advantage over a low I.F., and it is mainly with the object of eliminating troublesome whistles and interference from reception with the change from low I.F.'s to high I.F.'s has taken place. Some indication of the care with which an I.F. must be chosen can be obtained from this paper, but the two standard frequencies of 175 K.C. and 455 K.C. fulfil practically all requirements as far as broadcast reception is concerned, while the proposed frequencies of 1,645 or 1,675 K.C. should be quite suitable for short wave receivers. It is interesting to observe that the Post Master General's Department has decided to allocate a clear channel between 450 and 460 K.C. especially for I.F. use.

The R S.G B. Carries On

Extract from the Editorial of the September, 1939, "T. and R. Bulletin" indicates English Amateurs' attitude to war conditions, and corresponds closely to our own views already expressed. It is up to YOU to work along these lines and let us have what information you can for publication in your magazine.

A MESSAGE TO YOU FROM THE COUNCIL.

War or no war, it is our intention to carry on the work of the Society to the very best of our ability. The pillars on which the Society stand must not be allowed to crumble or decay, for it is essential that when Peace returns, the organisation must be strong and virile, fully prepared to safeguard the interests of its members.

An important factor is to keep "The T. & R. Bulletin" in existence, and this we shall do with the co-operation of our many advertisers who have promised their support. That its size must be reduced will be obvious to all, but we shall continue to publish articles and news of general interest.

During the months of strain which lie ahead we recommend that members should, as far as circumstances permit, carry on with experimental work within the terms of their normal broadcast licences. In particular we hope that members will endeavour to correlate information concerning general conditions so that a monthly summary may be recorded. Numerous amateur signals will still be heard, and we know of no reason why details of such reception should not be published, whilst experimental work on the bench, particularly with regard to receivers, valves, measuring gear, and components is still possible.

As mentioned earlier, the co-operation which has been promised by "Bulletin" advertisers encouraged us to carry on, and we believe that members at home and abroad will see to it that those who have offered their support in the important field of advertising will have no reason to regret their decision. Experimental amateur radio must not be allowed to die in Great Britain; let each one of us to-day pledge to keep it alive by supporting to the best of his or her ability, the National Society in Great Britain, your Society and ours.

CRYSTALS

STILL

463 KC GATES - - - - - - **£2**

2,000 KC Oscillators for double-detecting Supers - - - - **10/-**

I.F. TRANSFORMERS

1,600 k.c. Litz Wound Sirufer I.F. Transformers — Trolitol Insulation, **16/-** each.

Set of 3, including Crystal Gate, **70/-**

IMMEDIATE DELIVERY FROM—

MAXWELL HOWDEN-VK3BQ 15 CLAREMONT CRESCENT CANTERBURY, E.7., VIC.

Tel. WF 5090

ROYAL AUSTRALIAN AIR FORCE

VACANCIES FOR MEN WITH WIRELESS OR ELECTRICAL QUALIFICATIONS.

Apply to your nearest Recruiting Centre for details of enlistment as:—

(1) **WIRELESS OPERATORS (For Training)**

FOR MEN WITH A SOUND EDUCATION AND WITH OR WITHOUT ABILITY IN MORSE CODE.

(2) **AIRCRAFT ELECTRICIANS (For Training)**

FOR MEN WITH GARAGE OR OTHER TECHNICAL EXPERIENCE.

INSTRUCTORS WANTED

Applications will be received from men for the following Civilian positions:—

(a) **MORSE INSTRUCTORS (Civilian)**

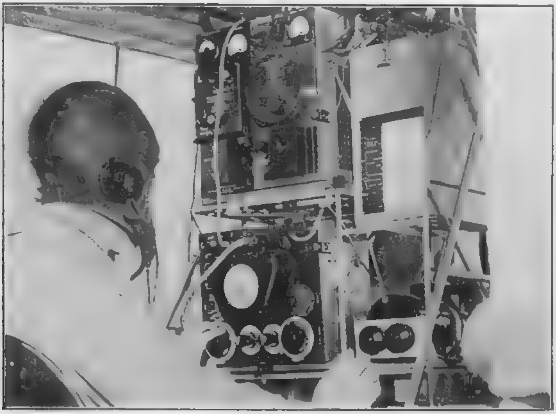
FROM EXPERIENCED TELEGRAPHISTS.

(b) **RADIO THEORY INSTRUCTORS (Civilian)**

FROM MEN WITH A SOUND KNOWLEDGE OF RADIO PRINCIPLES AND WITH EXPERIENCE IN HANDLING TRANSMITTERS.

Full Details may be obtained on application to:—

THE SECRETARY,
Air Board, Victoria Barracks,
Melbourne, S.C.1.



TRAINING A WIRELESS OPERATOR FOR THE R.A.A.F.

A visit to the Air Force Signal School, at Point Cook, Melbourne gives a clear idea of the comprehensive training a recruit receives before being passed out of the School as a fully-fledged Service Wireless Operator

The R A A.F. takes eight months to train a Wireless Operator to the required standard "from the raw" In the first fortnight, the trainee undergoes a course of drill, and is introduced to Air Force discipline The following eight weeks see him engaged in a Theory course, which involves study of elementary mathematics and science In the next eight weeks he takes a course of Radio and Electrical Theory In the third eight weeks he is instructed in the practical side of radio and in the use of the equipment he will encounter under Service conditions. In the final eight weeks he studies Air Force operations procedure, engages in exercises under actual flying conditions, gains experience of mobile land operation, and takes part in squadron signals exercises

During all stages of the course, he is continually practising the transmission and reception of Morse the average time required to work up to the requisite standard of 25 w p m. being 450 hours The R A A F method of teaching Morse is of particular interest Instead of following the conventional practice of sending each letter at a speed commensurate with the number of words per minute, the R A A F instructors start the trainee off with code letters sent at the maximum speed, 25 words per minute, although the groups of letters may result only in an aggregate speed of 15 w.p.m

This is done by putting a Wheatstone Automatic Transmitter with a selector device, which eliminates possibly one in every four or five letters when the transmitter is operated at 25 w p m In the first case, the resultant speed of signals heard by the trainee would be 18 to 19 w p m , and in the second case 20 w p m At the same time, each individual character is being sent at 25 w p m It is claimed for this method that the necessity for aural and mental re-adjustment as speeds are increased, is eliminated Adjustment of the selector device enables more than seven different speeds to be obtained from the Wheatstone Transmitter.

When the trainee has reached a reasonable degree of proficiency with the code, he is introduced to actual operating procedure For this purpose, a number of small huts, each capable of holding two operators is connected by landlines with the signal office These huts are connected to remote controlled transmitters and the whole system placed in operation to duplicate service conditions In addition, portable equipment is taken out in motor lorries and, with their personnel are set down around the aerodrome From these points they too, work back to the signal office and exchange traffic with the operators at this base station

Finally, flying experience is given to the recruit so that he becomes familiar both with the aircraft equipment and the conditions under which it must be used

Radio Amateurs enlisting or other recruits, who possess equivalent qualifications, are only put through a short Signals Course in Morse and Radio Theory to take them to the necessary standard Then they proceed with the normal instruction in Service equipment, operating procedure, etc , before being passed out as a fully trained Service Operator. They are then attached to units in one of the most essential positions in modern warfare, that of providing communications

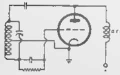
Modulated Oscillators for Receivers

By courtesy, Amalgamated Wireless Valve Co. Pty. Ltd.

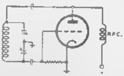
For convenience, the basic circuit diagrams of the Hartley, Colpitts and Electron-Coupled oscillators are shown as Figs. A, B, and C, respectively. The output voltage from these oscillators has a constant frequency and amplitude and is unmodulated (see Fig. 1).

When such a voltage is applied across the aerial input circuit of a receiver, it will be amplified by the R.F. and I.F. stages in the same manner as a carrier input voltage, but being unmodulated, it will not produce an audio-frequency component in the plate circuit of the detector and hence an audible output in the loud-speaker. An unmodulated oscillator cannot therefore be used for aligning a receiver in the normal manner.

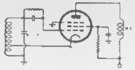
A



B



C

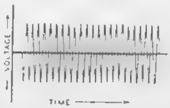


An unmodulated voltage is nevertheless useful for tracing such faults as background noise, modulation hum, and microphonicity in the radio-frequency portion of a receiver, while excessive regeneration in these stages may also be readily detected by noting the amount of "swishing" produced as the receiver is tuned across a weak unmodulated signal.

Modulation.

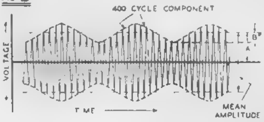
In the majority of applications, circuit adjustment is usually carried out by observing audio-frequency power output as indicated by some form of output meter, so that it is necessary for the R.F. input voltage from the oscillator to be amplitude-modulated at an audio frequency.

FIG 1



For testing purposes, a "standard signal" has therefore been adopted and consists of an R.F. voltage of constant frequency, modulated to a depth of 30% by an audio voltage having a frequency of 400 c/s. The wave-form of this standard signal is represented graphically in Fig. 2. Adherence to this standard, although desirable, is not strictly nceessary for normal service work.

FIG 2

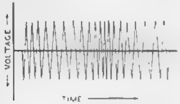


DIMENSION "B" = 30% DIMENSION "A"

The output voltage of a modulated oscillator should be as free as possible from frequency modulation, i.e., variation of the frequency of the R.F. voltage about a mean frequency (see Fig. 3), since this causes the

signal to be broad and consequently unsuitable for use in aligning sharply tuned circuits.

Fig. 3

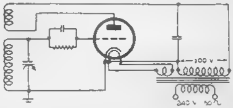


Modulation from A.C. Mains.

Possibly the simplest method of obtaining modulation is to apply a 50 cycle A.C. voltage directly to the plate of the oscillator valve, as shown in Fig. 4. With this arrangement, oscillation ceases during each alternate half-cycle, when the plate becomes negative with respect to cathode. The waveform is therefore similar to that shown in Fig. 5. Frequency modulation may be serious, and the signal is usually broad and difficult to use.

Considerable improvement can be effected by supplying the plate with a D.C. voltage upon which the 50 cycle A.C. voltage is then superimposed. By this means, it is possible to obtain a sinoidal wave-form and to adjust the percentage modulation to that required. In practice, however, it is found that a higher modulation frequency is desirable.

Fig. 4



Self-Modulation.

Under certain circumstances, an oscillator may be made self-modulating, and it is then said to be "squegging." For this purpose, the time

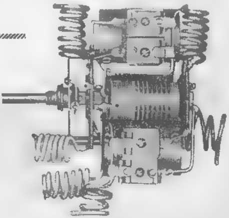
AEGIS

QUALITY PARTS

Include: Dials, Edgelit; Coils Solonoid, B/C and S/W; Coils Permeability Iron Core; Dualwave Kits; R.F. Chokes; Power Transformers; Microphone Stands; Padding Condensers

Trolitul Coil Formers with Lugs, **1/3 each.**

We are also factory representatives for Marquis Radio Lines, S/W Formers, Potentiometers Instrument Knobs, etc.



AEGIS DUAL WAVE TUNING KIT TYPE DW4

Self-contained, comprising Aerial, Oscillator, Short Wave and Broadcast Coils, four separate Ceramic type Trimming Condensers, Yaxley two-band Switch. All coils mounted and wired, and color-coded. Matched to Stromberg Type H Condenser.
The ideal Wave Kit for Manufacturers, Experimenters and Replacement.
Available in A.C. or Battery Oscillator Types.
"AEGIS" DW4 KIT. Price, 25/-

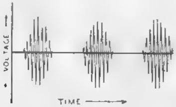
J. H. MAGRATH PTY. LTD.

208 Little Lonsdale St., Melbourne, C.1. Cent. 3688

N.S.W. AEGIS Representative: Reg. Rose Pty. Ltd., Sydney

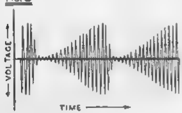
constant of the resistor and condenser in the grid circuit is made very long (preferably by increasing the capacitance of the condenser), so that the grid "blocks" and breaks the oscillation at a suitable audio frequency.

Fig. 5



The modulation percentage is usually very high and the wave-form far from sinoidal. A well-adjusted "squegger" has a modulation envelope similar to that shown in Fig. 6. Frequency modulation is usually serious, and the application of the arrangements is consequently limited.

Fig. 6



Audio Oscillators.

In the better class of equipment the required modulation voltage are almost invariably, provided by a separate audio oscillator.

An audio oscillator is similar in principle to an R.F. oscillator but necessarily uses very much higher values of inductance and capacitance in the tuned circuit. The wave-form is largely dependent on the characteristics of the tuned circuit and very careful design is necessary if the output is to be sinoidal. In general the "Q" factor of the inductance should be as high as possible, which means in effect that resistive loading across it should be reduced to a minimum.

In small service oscillators where some audio distortion can be tolerated it is possible to use for the inductance the windings of a small audio transformer. Under such circumstances, it is usually advisable to inspect the wave-form on a cathode-ray oscillagraph.

The high frequency oscillator may be modulated in a number of ways, but plate modulation is most commonly used. Whatever the method, the object is to vary the amplitude of the high frequency signal at an audible rate without affecting its fundamental frequency.

Attenuation.

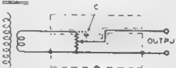
The radio-frequency voltage developed by a modulated oscillator is comparatively high, and only a small fraction of it is required for receiver testing. For normal service work, the R.F. output voltage on all bands should be adjustable, either continuously, or in frequent steps between approximately 0.5 volt and 2 microvolts.

Such requirements demand that the whole assembly be effectively shielded so that the only outlet for R.F. voltages is by way of a suitable attenuator network.

For effective shielding it is necessary to shield individually all major components, and to encase the whole in a heavy gauge metal case. Thin shielding is usually quite ineffective. Any shafts leading through the panel of the oscillator should be properly earthed, and ventilation holes covered with wire gauze. Where the oscillator operates from A.C. mains it is necessary to filter the power leads at the point of entrance to the case. A good earth connection is also desirable. It will be found that effective shielding is very much more difficult to obtain at higher frequencies.

Attenuators may be roughly divided into three classes, namely resistive, inductive and capacitive.

Fig. 7



Resistive Attenuators.

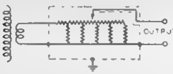
Fig. 7 shows a simple type of resistive attenuator. A suitable R.F. voltage is fed from a low-impedance link coil to the outer terminals of a potentiometer and the output is taken from the variable tapping. The degree of attenuation which may be achieved is dependent largely on the stray capacitances (shown as C) between the input and output leads.

The output impedance, which may be an important consideration, obviously varies with the setting of the

control. The input impedance is also liable to vary under certain circumstances and may lead to some frequency shift due to variable loading on the oscillator coil.

Fig. 8 shows a type of attenuator which is widely used in standard signal generators. With correct design, it is possible to obtain adequate attenuation, with input and output impedances which are fairly constant for all settings of the control.

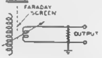
Fig. 8



Inductive Attenuators.

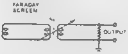
Inductive attenuators vary a great deal in mechanical design but depend on the same general principle, namely, that of varying the mutual coupling between a coil connected to the output terminals and a coil carrying the radio-frequency currents generated by the oscillator. Fig. 9 shows the fundamental circuit. The Faraday Shield is usually included and serves to eliminate direct capacitive coupling between the coils.

Fig. 9



This type of attenuator provides a ready means of attaining a constant low-impedance output characteristic, but has the disadvantage that the variation in mutual coupling between coils may lead to some frequency shift. This effect can usually be made small by restricting the range of the attenuator.

Fig. 10



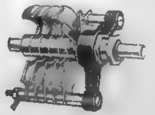
Figs. 10 and 11 show the basic circuit and the construction of an inductive "piston attenuator."

FOR...

RECEIVER EFFICIENCY—

FIT EDDYSTONE MICRODENSERS AND ENSURE SATISFACTION

EDDYSTONE



Famous Microdensers

- 1. Brass construction throughout with DL-9 high frequency insulation.
- 2. Both stator and rotor sections soldered to ensure low series resistance.
- 3. Every vane and whole condenser lacquered to prevent oxidisation and consequent H. F. losses.
- 4. Will not change capacity constants due to oxidisation after years of use, or change in efficiency.
- 5. Long spindle bearing, absolutely noiseless on highest frequencies
- 6. No losses of any sort are measurable when a microdenser is put in circuit with the most efficient coil procurable.

No. 1094— 3-18 M.MFD. Price, 6/9 **No. 1129**—4-40 M.MFD. Price, 7/-
No. 1130 4.5-100 M.MFD. Price, 8/- **No. 1131**—5-160 M.MFD. Price, 12/9

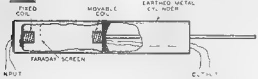
IT PAYS TO BUY THE BEST. YOUR DEALER CAN SUPPLY.

BRISBANE: Chandlers Pty. Ltd.
MELBOURNE: P. & L. Wireless Pty. Ltd.
ADELAIDE: Gerard & Goodman Ltd.
SYDNEY: United Radio Distributors Pty. Ltd.
PERTH: Carlyle & Company.
HOBART and LAUNCESTON: W. & G. Genders Pty. Ltd.

Capacitive Attenuators.

A capacitive attenuator is in reality a small variable condenser which is connected in series between the output terminal and a point of higher R.F. potential. (See Fig. 12).

Fig 11



This type of attenuator has a high-impedance output characteristic and must be shunted by a resistor when connected in the grid circuit of a valve. Variation in capacitance may cause some frequency shift, but this may usually be minimised by restricting the range of control.

Fig 12

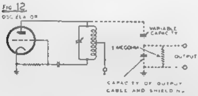
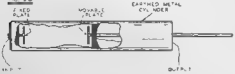


Fig 13 shows the construction of a capacitive "piston attenuator" which has ben widely used in modulated oscillators.

Output Impedance.

When the output of the oscillator is fed directly to the grid of a valve the actual output impedance is seldom important provided that there is a D.C. path between grid and cathode.

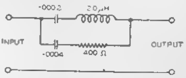
Fig 13



When the oscillator is connected to the aerial terminal of a receiver, the loading imposed by the oscillator on the first tuned circuit should simulate that of an average aerial. For this purpose, manufacturers of standard signal generators provide a "dummy antenna," containing standardised values of resistance, capacitance and inductance, which may be connected in series with the oscillator lead. Fig 14 shows the dummy antenna which has been adopted as standard by the American Institute of Radio Engineers. The characteristics of this dummy antenna are only correct if the output impedance of the signal generator is low (i.e., less than 50 ohms).

In the majority of cases, it is possible to neglect the effect of output impedance and to make final adjustments to the aerial coil trimmer with a normal aerial connected to the receiver. Sufficient signal may be obtained simply by twisting the output lead of the oscillator around the aerial lead, and increasing the output voltage.

Fig. 14



(Continued on Page 22)

DX Notes

By VK3MR

Following the scarcity of news last issue, this month is no exception, and "things is tuff." Out of the heart of Australia a much climatised apparition in the shape of BERS 195, has appeared, and is enjoying the cooler (?) weather of Sydney. Eric's name first came before the Ham world when he used to hear all the short wave CW sigs on their overtones on about 160 metres and a full and convincing report was sent to the unfortunate ham who had to decipher the letter! His pet "nick name" was "The Overtone King," but now he is known in respectable circles as VK5TK. He has had 13 years of listening, and during that time has heard 173 official countries, and 144 have qsl'd. It becomes obvious that he has taken the receiving side seriously, as he has won 3 cups and 8 BERU certificates and, in all, 13 different certificates. His bread-winning hobby has been brass pounding for the P.M.G., but is now mixed up with aviation. News from little known places seems to be the order, as I have also heard from VK7AB, who assures me that Tasmania is still in existence although rapidly getting smaller and beautifully less. Doug has been getting excellent reports on 10 mx from U.S.A. using a centre fed 135 ft. ant., and just prior to hostilities, had purchased much oregon for his new beam, but now is using some to start up the fire in the a.m.'s. Like 3KX, he finds that fishing is even more difficult than working dx. What is your final list of countries, om? Ditto, 2DG. I have had enquiries for the qra of Fritz Haas ex OE1FH, who is reported to be in VK5 somewhere. Who will oblige. The dx page in the R.S.G.B. mag. has now been changed to "The Month Off the Air!"

PHONE B 4148

Mann Printing Co

COMMERCIAL AND ART PRINTERS

98-100 HARRINGTON STREET, SYDNEY

Specialise in the Printing of . . .

QSL CARDS

which are Distinctive and Attractive

Federal and Victorian QSL Bureau

R. E. Jones, VK3RJ, QSL Manager.

The flow of incoming cards has almost ceased, only 200 being received during December, in lieu of the customary 3500.

VK stations should seize the respite and bring their QSL's up to date.

Cards for the following VK3 stations are making their final appeal. If unclaimed by January 31st they will be destroyed. A stamp to the Bureau, 23 Landale Street, Box Hill, will reprieve them.

VK3AC, AP, BH, CQ, CU, DJ, EF, EH, GX, HI, HV, IF, IS, IU, KQ, KT, LI, ND, NP, PH, QE, QG, ST, TF, UC, UV, UX, VA, VB, VD, VW, XK, XU, XZ, ZC, ZD, ZJ.

CONTEST NOTES.

R. E. Jones, VK3RJ,

RESULTS OF THE 1939 VK-ZL 80 METRE FONE CONTEST.

The results of the above contest have been released by the N.Z.A.R.T.

UNLIMITED SECTION.

1st	VK2NY	1020 points
2nd	VK3WE	1010 "
3rd	VK3DG	845 "
4th	ZL2GX	695 "
5th	VK2OE	605 "
6th	ZL2JB	465 "
7th	VK3CH	420 "
8th	ZL3CP	380 "
9th	VK4JF	345 "
10th	ZL2WQ	315 "
11th	ZL2JR	275 "
12th	VK2HZ	140 "
13th	VK3OR	120 "
14th	VK4AW	105 "
15th	VK4LN	40 "

LIMITED SECTION.

1st	VK2AJK	570 points
2nd	VK2YL	335 "
3rd	VK3TL	265 "
4th	VK5BG	255 "
5th	VK5RN	190 "
6th	VK3EF	165 "

Logs from VK4HA and VK3IG were received after the closing date and therefore could not be accepted.

Certificate Awards will follow in due course to the winning stations.

HAMS!!

DO NOT REMAIN INACTIVE, REBUILD YOUR RECEIVERS, AND OF COURSE USE THE BEST——

EDDYSTONE COMPONENTS

Victorian Agents—

P. & L. WIRELESS SUPPLIES PTY. LTD.

213 ELIZABETH STREET, MELBOURNE

F 4323 Write or Call for a Catalogue.

Divisional Notes

IMPORTANT.

To ensure insertion all copy must be in the hands of the Editor not later than the 18th of the month preceeding publication.

N.S.W. DIVISION.

President: H. F. Petersen, 2HP.

Vice-Presidents: W. G. Ryan, VK 2TI and F. Carruthers, VK2PF.

Secretary: C. Horne, VK2AIK.

Treasurer: H. Ackling, VK2PX.

Editor of Notes for this Division: J. H. Fraser.

Interstate and Country Visitors should ring FX3305.

No notes arrived from VK2 this month, although we delayed going to press as long as possible. Chaps! Let your Notes Editor know what you are doing, and tell him **early,** as copy must be sent to Melbourne before the 18th of each month.

VICTORIAN DIVISION.
KEY SECTION NOTES.

By VK3CX.

The attendance at the December K.P.S. meeting was very large and after many mishaps with the elevator, which necessitated many of the boys getting out one floor short and tramping up the stairs, the meeting opened at 8.10 p.m. with QW in the chair.

Business was rapidly disposed of and after R.J. had distributed the usual batch of QSL's, which continue to roll in, the main item of the evening was presented.

It was a lecture by Mr. Quadling, of the Marconi School, on "Direction Finding." It says much for his prowess as a lecturer, when the boys even forgot to light their cigarettes, and at the conclusion of the lecture the questions came at him from all sides. It seems that there is going to be quite a lot of interest taken in D.F. in the near future.

Many new faces were noticed at the meeting, and it appears that now the lads cannot talk to each other over the air, they are forced to come to the monthly meetings to have personal contacts. The gang are still retaining their interest and much work is being done on receivers. The latest to succumb to the craze is H.K., who has just completed a 13 tube job, but wants something to put in the upper left corner of the panel to match the "R" meter in the upper right corner. CX suggested that he include an electric clock, but he still wants other suggestions.

CZ is back from gold hunting. The best that he could do was to see the hole that someone once got something out of, and so he is forced to go back to the office with his dreams of striking it rich. Hard luck, Arthur. B.G. is still grinding crystals, and is running short of material, so if you have a nice big piece of quartz, you know what to do with it. Playing cricket recently, CX found that two members of the opposing team were PG and HT. He won't say who won, but we can guess. CX's antenna is still radiating — during a recent thunderstorm he found 3 inch sparks jumping from one feeder to the other. He wants to know if the bloke up above has a permit from the R.I. to send out spark transmissions like that. Ho, hum—see you next month, fellows.

SOUTH AUSTRALIAN DIVISION.

DIVISIONAL NOTES.

By VK5RN (Not RM).

Early in December, Professor Kerr-Grant very kindly gave us a lecture on "Modern High Voltage Generators and their application in modern transmutation experiments." In his lecture, Professor Kerr-Grant dealt with generators of all types and illustrated his talk with lantern slides. Although the attendance at this meeting was not so good as was expected, everyone present had an intensely interesting evening. The lecture started at 8 p.m. and finished at 9.30 p.m.

The second class commercial exam. took place early this month, and three of our members sat for it. However, many more will be taking the March exam. On Tuesday, December 5, the theory and regulations exams. were held, and on Wednesday, candidates were taken down to Port Adelaide to have a practical test on commercial equipment, including direction finding apparatus.

We learn that VK3EF will be coming over to S.A. for a short stay during Xmas, but by the time these notes appear, Bert will be safely home again in Warracknabeal, but anyway, we hope that he enjoyed his stay in VK5, and that he will repeat his visit in 1940.

To keep the old Xmas "Spirits" up, the Xmas meeting will be held as usual on Wednesday, December 20, and we expect that this meeting will be well attended, as it has always proved a popular function in the past, and should prove even more popular now that we are denied our field days and other activities.

Our code practice classes have recently taken the form of practice in handling telegrams in the correct (?) commercial style. We have a buzzer and two keys connected in series, and an operator at each key so that the result is perfect "break in" operation, added to which both operators are within talking range of each other and can, if all other methods fail, send the telegram by voice.

HILCO MELBOURNE

The Power Equipment with a Powerful Reputation . . .

THE Organisation responsible for the production of . . .

HILCO TRANSFORMERS CHOKES, etc.

has proved its high standards for an article of extreme merit as accepted by the largest consumers in Australia.

ALL PRODUCTS GUARANTEED FOR TWELVE MONTHS.

HILCO TRANSFORMERS PROPRIETARY LIMITED

97-111 BERKLEY ST., CARLTON, N.3., Vic. 'Phones; F1661-2

CABLES & TELEGRAMS: "HILCOY," MELBOURNE.

Another of our members, VK5ZZ, has joined the R.A.A.F., and has gone to Victoria for 8 months' training; we wish him every success and safe landings.

In addition to the list of stations published last month, we have received yet more cards from Headquarters, and they are still arriving, although not in such large quantities as previously.

Although Xmas will be over when these notes appear in print, I can still take the opportunity of wishing everyone a prosperous New Year, and good listening for 1940.

HAMS!

DO YOU WANT TO BE BACK ON THE AIR?

The Wireless Institute of Australia

is the recognised spokesman of the AUSTRALIAN AMATEUR.

If you are not a member——

Join Now!

When the time comes that we can reasonably expect to go back on the air, we want to say that we represent—

EVERY ACTIVE HAM

in the Commonwealth.

Strengthen our hand by writing to The Secretary of the Institute in your State to-day.

All addresses are on the title page.

RADIOTRON DESIGNER'S HANDBOOK.

Third Edition.

The third edition of the Radiotron Designer's Handbook, which is at present in the course of being published, is expected to be available early in the New Year. Copies will then be procurable through the principal booksellers.

This handbook, the first two editions of which proved so widely popular, has been completely rewritten from cover to cover and enlarged to such an extent that it can now claim to be an invaluable book of reference to all those engaged in radio engineering.

Including no less than 40 chapters, the following subjects are fully covered: Radio frequencies, rectification filtering, receiver components, tests and measurements, valve characteristics, general theory, together with tables, charts and sundry data.

A large proportion of the material is unobtainable from text books or other sources, and has been written specially to meet the demand for such information. Very complete treatment has been given on negative feedback, tone compensation, tuned circuits, rectification, filtering, transformers, receiver tests and measurements, valve testing, valve voltmeters and the graphical representation of valve characteristics.

The entire edition is copiously illustrated with diagrams and a large number of curves have been given for the graphical solution of special problems. Useful tables have also been given, these including very complete tables of capacitive and reactive inductances and the impedance of a resistance and capacitance in parallel.

This new edition of the Radiotron Designer's Handbook, with its 300 pages, has been produced as a Radiotron service, and every radio technician should make a point of including it in his reference library.

The price will be 3/-.

(Continued from Page 16)

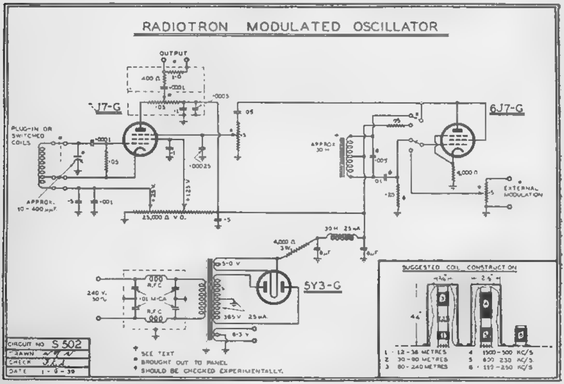
Output Voltage Measurement.

For laboratory or receiver production work it is necessary to know accurately the value of the output voltage. For this purpose, standard signal generators incorporate some means of measuring the output voltage, usually by means of either a thermo-couple or a valve voltmeter. This facility, however, is seldom warranted in oscillators intended for service work, and an arbitrary scale on the attenuator control for purposes of comparison is usually quite sufficient. In such cases, actual calibration in microvolts must be regarded as approximate only.

Radiotron Modulated Oscillator.

Fig. 15 shows a practical design for a modulated oscilator.

The radio frequency voltage is generated by a 6J7-G connected as an electron-coupled oscillator, and the output is taken from a 50,000 ohm potentiometer in the plate circuit. A reasonably smooth control may be obtained if a well-tapered poteniometer is used in this position. The various bands are selected by



Band	Wire	Turns	Layers	Tap*	Winding
12-36 metres	22	7.5	1	1.5	16 T.P.I.
35-105 metres	27	19.5	1	2.3	Close Wound
80-240 metres	27	63	1	6	Close Wound
1500-500 Kc/s.	31	190	1	15	Close Wound
600-210 Kc/s.	31	310	3	20	Length = 1 in.
250-100 Kc/s.	33	610	5	30	Length = 1 in.

*Should be adjusted for best results.

FIG. 15. Circuit arrangement of Radiotron Modulated R.F. Oscillator.

Submit Your Transformer Problems To Us

We are illustrating our new die-made steel case used in our range of stalloy cored audio transformers of all sizes.

This type of case has just been released, and offers a number of advantages over other makes available on this market, such as—

- **Reversible mounting**
- **High grade stoved black wrinkle enamel finish**
- **Cadmium plated brass soldering lugs**

The new case is particularly attractive in appearance, and where "dressing" is important, you cannot do better than specify "Trimax."

Even if you are not rebuilding, we know you'll have a Merry Xmas—and to all our customers and friends we take this opportunity of saying—"Good Luck—and a Happy and Prosperous New Year."

HARRY CLIFF.
RUPERT C. PETERSON.

TRIMAX TRANSFORMERS

(A DIVISION OF CLIFF & BUNTING PTY. LTD.)

Registered Office:

29-35 FLEMINGTON RD., NORTH MELBOURNE.

PHONE: F 9127 (2 lines)

means of a double-pole six-way wave-change switch.

Modulating voltages are applied to the suppressor grid of the oscillator valve, the depth of modulation being controlled by the 0.5 megohm potentiometer.

The second 6J7-G may be used either as an audio amplifier for external modulation voltages, or as a Hartley oscillator for internal modulation.

Reasonal sinoidal wave-form may be obtained by using for the inductance a standard push-pull speaker transformer. The associated components marked with an asterisk were correct in the experimental model but may need modification with different transformers.

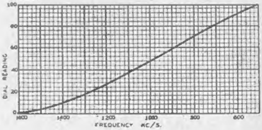
The power supply shown is recommended although any other may be used which provides the required supply voltage and current. If the oscillator is to be really useful it should be fully calibrated on all bands, preferably by drawing a complete set of curves of frequency against dial setting. A typical calibration curve is shown in Fig. 16.

On the broacast and short-wave bands sufficient reference points may usually be found by heterodyning the oscillator against stations of known frequency, and listening for zero meat in a receiver. Some care has to be exercised particularly on the short-wave band to avoid confusion due to harmonics from the service oscillator and "second spot" tuning effects in the receiver.

On the 465 Kc/s I.F. band a more indirect method must be adopted The approximate dial setting for 465 Kc/s may readily be found by feeding the output of the oscillator through the I.F. channel of a receiver known to be aligned at or near this frequency. Once having determined the approximate setting, accurate calibration may be carried out with the aid of the second harmonics.

If, for example, the receiver is tuned to a station on 930 Kc/s, and the oscillator output lead brought close to the aerial terminal, a beat note will be heard as the oscillator is tuned through 465 Kc/s. Similarly with the fundamental on 460 Kc/s the second harmonic will fall on 920 Kc/s. By repeating this process it should be possible to draw an accurate calibration curve for the whole band.

FIG. 16



Calibration of the 175 Kc/s I.F. band is also possible by similar means, but greater care must be exercised in discriminating between the various harmonics.

(To be continued).

HAMS

WHEN REBUILDING YOUR RECEIVER
REPLACE YOUR OLD SPEAKER WITH

AMPLION

THE NEW 12in. ELECTRICALLY WELDED SPEAKERS

MODEL	Air Gap Flux	Weight of Magnet	POWER OUTPUT. Undistorted—Max		Diameter	PRICE
V	8,300	12 ozs.	10 watts	15 watts	$12\frac{3}{16}''$	£2 3 0
VL	9,000	22 ,,	13 ,,	20 ,,	$12\frac{3}{16}''$	£2 16 0
VP3	12,000	64 ,,	20 ,,	30 ,,	$12\frac{3}{16}''$	£5 10 0
VP2	9,000	20 ,,	12 ,,	18 ,,	$12\frac{3}{16}''$	£3 6 6
VPI	7,500	14 ,,	8 ,,	12 ,,	$12\frac{3}{16}''$	£2 10 0

Types V and VL are Field Type Speakers.
Types VPI, 2, 3 are Per-Magnetic Speakers.

SILVERED MICA **T. C. C.** **CERAMIC CONDENSERS**

T.C.C. Silvered Mica Condensers are guaranteed to maintain their capacity under all temperatures, thus insuring no frequency drift in Supers. The foil is actually plated on the mica.

We can supply these Condensers in any per cent. of accuracy, including 0%.

The Capacity Range is from 10 mmf to 800 mmf.

LIST PRICE, 1/- EACH.

We are Agents for—

I.R.C. RESISTERS.
AMPLION SPEAKERS.
BIRNBACH INSULATORS.
T.C.C. CONDENSERS.
BRUNO MICROPHONES.
TRIMAX TRANSFORMERS.

AUSTRALASIAN ENGINEERING EQUIPMENT CO. PTY. LTD.

370 Little Collins St., Melb. Phone: F 5585

Let us quote you for your

PRINTING REQUIREMENTS

The House of Good Printing

285-287 LATROBE STREET,

MELBOURNE, C.I

Opposite "The Argus" Office

Telephone MU 2897 After Hours FU 6795